



DEPARTMENT OF THE ARMY

HEADQUARTERS UNITED STATES ARMY TRAINING AND DOCTRINE COMMAND
FORT MONROE, VIRGINIA 23651-5000

REPLY TO
ATTENTION OF

AD-A286 305



ATCD-H

24 Oct 94

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JUL 11 1994
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MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Electronic Attack Capability in Army Modeling and Simulation

1. Modeling and simulation is a quick and efficient means for the Army to evaluate doctrinal implications and provide cost effective training for commanders and battle staffs to perfect their planning techniques and execution skills. This type of exercise/training and analytical driver becomes particularly critical as we continue to increase our use of the electromagnetic spectrum in support of Command and Control Warfare (C2W) and Information Operations. The Electronic Warfare component of C2W is a powerful combat multiplier on the battlefield and requires careful and comprehensive staff coordination when integrating EW into the C2W strategy.
2. The enclosed report reviews the Army's existing modeling and simulation capability for the Electronic Attack (EA) function of Electronic Warfare (EW). The report suggests that EA capability in the analytical and training models and simulations is marginal and provides insights on some near- and mid-term improvements.
3. Follow on work will finish the review of the Army's modeling and simulation capability for the two remaining EW functions (Electronic Support and Electronic Protect) as applicable to supporting C2W and Information Operations. Project will culminate with a strategy on how to improve EW modeling and simulation capabilities and road map to implement the strategy.
4. This report should contribute to the literature search phase of the "EW Value Added" study being conducted by the Early Entry Battle Laboratory and the U.S. Army Intelligence Center.

5789 94-34248



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ATCD-H

SUBJECT: Electronic Attack Capability in Army Modeling and Simulation

5. TRADOC POC is Mr. Bob Miner, ATCD-H, (804) 727-2664 or DSN 680-2664.

FOR THE DEPUTY CHIEF OF STAFF FOR CO' T DEVELOPMENTS:

Encl


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COL, GS

Director, Space and Electronic
Warfare Directorate

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ATTN: SFAE-IEW-SE (18), Vint Hill Farms Station, Warrenton, VA
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Program Manager, Training Devices, ATTN: AMCM-ARD, 12350
Research Parkway, Orlando, FL 32826

Science and Technology Integration Center, Defense Technical
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Alexandria, VA 22304-6145

Dean, Joint Command, Control, and Electronic Warfare School,
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Statement A per telecon
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NWW 11/9/94

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**ELECTRONIC ATTACK
LITERATURE SEARCH REPORT**

**DEPUTY CHIEF OF STAFF FOR
COMBAT DEVELOPMENTS**

SEPTEMBER 22, 1994

TABLE OF CONTENTS

TABLE OF CONTENTS	i
LITERATURE ANALYSIS	1
Section I - Background	1
Section II - Literature Review and Synopsis Methodology .	1
Section III - Findings and Insights	3

Enclosures

A	Literature Search Publications	
B	Definitions	
C	Literature Search Form	
D	Publication Summary	
	OSD and Joint Staff	Tab 1
	US Army	Tab 2
	Periodicals, Books, and Miscellaneous	Tab 3
E	Functional Area Matrix	
F	Trip Reports	Omitted
G	Model/Simulation Data	

LITERATURE ANALYSIS

SECTION I - BACKGROUND

1. In accordance with the terms and conditions of TRADOC Contract Number DABT60-94-D-0001, Delivery Order Number 0022, Military Professional Resources, Inc. (MPRI) was tasked to collect, collate, and synopsize available government modelling information relevant to the Electronic Attack (EA) function of the Army's Electronic Warfare (EW) mission.

2. On July 19, 1994 a Detailed Management Plan for the Electronic Attack Literature Search was delivered to the Space and Electronic Warfare Directorate (SEWD). The purpose of the plan was to synchronize the work process, develop a logical methodology, and establish milestones for the project. This deliverable, the Electronic Attack Literature Search Report, is provided in accordance with that plan.

3. MPRI maintained close liaison with the SEWD project officer throughout the collection phase and compilation of this report.

SECTION II - LITERATURE REVIEW AND SYNOPSIS METHODOLOGY

1. The purpose of the Electronic Attack Literature Search is to review pertinent and peripheral references plus lessons learned, if appropriate, to ensure relevant information was considered for subsequent project development. The literature search provides source material necessary to satisfy the following requirements.

- Identify existing Army EA modelling and simulation capability.
- Provide insights on where the Army could emphasize its EA modelling and simulation efforts.

2. Review of pertinent and peripheral references included the following:

a. Resources identified for review were based upon potential applicability to the Army's modelling and simulation capabilities, specifically, those modelling and simulation resources dealing with the EA functional component of electronic warfare. This was accomplished principally through government provided documents, key word database searches, installation visits and discussions with subject matter experts. Remaining information was telephonically collected.

b. Time constraints precluded on-site visits with every Army organization using modelling and simulation during daily operations. Four key TRADOC training and analysis organizations were required visits. Time was also not available to physically observe models and simulations in use. Reviewed information was primarily Army source material. The consolidated list of 24 pertinent and peripheral publications reviewed is at Enclosure A.

c. Key terms applicable to EW and modelling and simulation are defined at Enclosure B. These definitions provided a common start point for user understanding, key word searches, and discussions with subject matter experts. The definitions for the functional components (Electronic Attack, Electronic Protect, and Electronic Warfare Support) of EW helped maintain the focus on the Electronic Attack function.

d. An initial key word search through the Defense Technical Information Center led to the identification of an Army modelling and simulation master database. This database entitled "Models and Simulations: Army Integrated Catalog (MOSAIC)" became the baseline document used during the search process.

e. A form that outlines essential electronic attack modelling and simulation information was developed and used for the literature search (Enclosure C). Item 1, Publication/Source, simply provides the name and date of the publication. A separate entry following item 1 designates publication currency and degree of usefulness from "essential" to "not relevant." Item 2 provides a synopsis of the publication to facilitate material review. Item 3 lists the category code(s) associated with each functional/subfunctional area that is identified in Content Highlights (Item 4). Item 4 provides a detailed breakdown of functional/subfunctional area relevant to the Electronic Attack function. Passages considered to be essential for specific functional areas are classified as "must read" and annotated with an asterisk.

f. Extensive review of designated reference material was conducted to determine the degree of applicability to Electronic Attack Modelling and Simulation. Publications were reviewed, summarized, and categorized based on the functional/subfunctional areas addressed in each publication. In many cases, more than one functional area was designated. Finite references, such as page numbers, chapter, and appendices were annotated adjacent to the appropriate functional/subfunctional area. Alphanumeric codes were then applied to the category codes associated with each area as a means to rapidly assess key functional areas for each publication. Individual publication summary sheets containing the results of each review are at Enclosure D. Publications are grouped at Tabs 1 through 3 (OSD and Joint Staff, US Army, and Periodicals and

books, etc). A consolidated functional area matrix is provided at Enclosure E.

c. Reports of trips required to review publications and hold discussions with subject matter experts are at Enclosure F.

Section III - FINDINGS AND INSIGHTS

1. Findings. Generally, Army modelling and simulation efforts are broadly categorized as live, virtual, and constructive (see Enclosure B for definitions). The findings address EA applications, if any, in each category.

a. Live Simulation. The Army provides live training environments for the planning and operational use of EA. The Combat Maneuver Training Center, the National Training Center, and the Joint Readiness Training Center rules of engagement allow the operational use of EA assets by the training units. However, multiple variables determine whether EA assets are used by the training units. Some key variables are:

- Equipment operational readiness status
- Units training proficiency on EA assets
- Strict exercise control of EA operational use

However, more importantly, planned training rotations to these training centers are limited and additional training is required to maintain unit and battle staff proficiency with EA assets.

b. Virtual Simulation. The use of EA applications in virtual simulations is limited. Currently the Army's use of virtual simulation is system specific, high resolution and is played on a small battle area. The importance of virtual simulators, with interactive EA capabilities, will grow as the use of directed energy type weapons evolve. This is true particularly for potential weapon system components of tanks and attack helicopters. Simulator Networking-Training and its planned follow-on, the Closed Combat Tactical Trainer, are excellent examples of a distributed interactive virtual simulation. Both are a series of different functional simulators and work stations linked together for simulations training.

c. Constructive Simulation. The majority of Army models and simulations fall into this category. They are the mainstay of combat developments and training. Over 250 Army models and simulations were reviewed to ascertain which, if any, accommodated an EA capability. The general types of constructive simulations reviewed were:

- Analysis

- Education and Training
- Production and Logistics
- Research and Development
- Test and Evaluation

A summary data sheet for each model and simulation that has an EA capability or is a potential candidate for an EA capability is at Enclosure G. It is important to note that if a model or simulation played a degraded jamming environment, that did not satisfy the criteria for an EA capability.

(1) Only six models and simulations reviewed contained an EA capability. Table 1 lists these by functional type.

MODELS AND SIMULATIONS	FUNCTIONAL TYPE				
	TNG	R&A	R&D	F/F	SYS
High Energy Laser Weapon			X		X
Low Energy Laser Weapon System			X		X
Army Laser Weapon Simulation		X		X	X
VECTOR in Command		X		X	
Combat Arms Task Force Engagement Model		X		X	X
Variable Intensity Computer Training System	X			X	
TNG - Training R&A - Research and Analysis R&D - Research and Development F/F - Force-on-Force SYS - System					

Table 1. Army Models and Simulations with an EA Capability

(2) Table 2 lists the primary models and simulations used by the TRADOC analysis community by functional type and command echelon. Of the four listed two have an EA capability. However, the data and decision tables required to execute the EA modelling capability have not been developed at this time due to other higher priorities and lack of available resources. An EA capability in the Eagle model is a potential future improvement.

MODELS AND SIMULATIONS	FUNCTIONAL TYPE					ECHELON					
	TNG	R&A	R&D	F/F	SYS	PLT	CO	BN	BDE	DIV	CORPS
✓VECTOR in Command		X		X							X
✓Combat Arms Task Force Engagement Model		X		X	X	X	X	X	X		
Eagle	X	X		X						X	X
Janus	X	X	X	X		X	X				
✓ EA Capability											

Table 2. TRAC Analytical Models and Simulations

(3) Table 3 lists the primary models and simulations used by the TRADOC training community by functional type and command echelon. The models and simulations listed are part of the Army Family of Simulations which are proponent approved. These models and simulations are used for training unit commanders and battle staffs in command post exercises as well as leader development training. Only the Variable Intensity Computer Training System has an EA capability. The Corps Battle Simulation (CBS) which is the Army's primary simulation to support battle staff training at the brigade through joint level does not have an EA capability. The Warfighters' Simulation 2000 which is planned to replace CBS in FY97 has an approved requirement capability to include EA modelling at the system level.

MODELS AND SIMULATIONS	FUNCTIONAL TYPE					ECHELON					
	TNG	R&A	R&D	F/F	SYS	PLT	CO	BN	BDE	DIV	CORPS
Janus	X	X	X	X		X	X				
Brigade/ Battalion Battle Simulation	X		X					X	X		
✓Variable Intensity Computer Training System	X		X				X	X	X		
Corps Battle Simulation	X		X						X	X	X
✓Warfighters' Simulation 2000*	X		X							X	X
✓ EA Capability * Under Development											

Table 3. TRADOC Models and Simulation

(4) The CBS is also the primary ground model used in the Aggregate Level Simulation Protocol (ALSP). The ALSP is designed to provide a linkage between service models to control progression of simulation time to support a suitable distributed exercise environment. The lack of an EA capability in CBS minimizes the Army's simulation contribution for the joint level battle staff to adequately train in the planning and execution of EA as a viable component of command and control warfare (C2W).

2. Insights

a. EA play/analysis in Army models and simulations is marginal. The two primary analysis models VIC and CASTFOREM have the capability already integrated to model EA assets. However, priorities and resources have precluded the completion of data requirements and decision tables. CBS, the primary simulations trainer for division and above battle staffs, does not have an EA modelling capability.

b. An EA strategy is required to reinforce the integrated use of EA in TRADOC models and simulations. This strategy should include:

- Investigating other Service EA efforts for Army utility. Examples are the Joint Electronic Warfare Electronic Combat Simulation (JEWECSI) and Air Force's Blue Flag exercises.

- Updating existing EA capability in analytical models and simulations. These models and simulations (e.g., VIC, CASTFOREM) are being used by the Battle Labs for the Army Warfighting Experiments which are designed to help develop future warfighting requirements.

- Ensuring the continued development of an EA capability in WARSIM 2000. WARSIM 2000 provides a potential near-term (FY97) capability for Army battle staffs to adequately train for the planning and operational use of EA assets. WARSIM 2000 is also projected as the Army's ground simulation component for the future Distributed Interactive Simulation.

- Investigating the development of an EA operational support aid to enhance a battle staff's capability to plan for and execute EA as a viable component of C2W. This computer driven aid would provide EA asset capability and coverage projection through menu driven windows capable of being overlaid on the current battle area.

LITERATURE SEARCH PUBLICATIONS
ELECTRONIC ATTACK MODELLING AND SIMULATION

OSD and JOINT STAFF

Modelling Handbook, Joint Electronic Warfare Center, Jun 89
Joint Electronic Combat Electronic Warfare Simulation (JECEWSI),
Joint Electronic Warfare Center, Undated

US ARMY

Models and Simulations: Army Integrated Catalog (MOSIAC)
Army Model and Simulation Master Plan, USDA, May 94
Memo, Electronic Warfare (EW) Force Level Models, 1 Aug 94
Battle Lab Campaign Primer 1994
Operational Requirements Document (OSD) for Warfighters' Simulation
2000 (WARSIM 2000), 24 Jun 93
Draft Military Operations Operational Concept for Electronic
Warfare, HQ TRADOC
Combat Training Centers (CTC) Bulletin Number 94-1, Mar 94
Inventory of TRADOC Models and Simulations, Feb 91
Information Papers, National Simulation Center, Oct 93
Briefing, Intelligence and Electronic Warfare Functional Model
(IEWFAM), USAICS, Undated
TRADOC Pamphlet 525-5, Force XXI Operations, Aug 94
Corps Battle System, Jet Propulsion Laboratory, Mar 92
The Janus 3.X/UNIX Mode Users' Manual, Titan, Inc., 30 Nov 93
Brigade/Battalion Battle Simulation System Overview, National
Simulation Center, 23 May 94
VICTORS Commander Planning Guide, National Simulation Center, 11
Aug 93
How to Train with ARTBASS, CATA, Jul 93

Exercise Rules of Engagement (EXROE), Joint Readiness Training Center, FY92

Rules of Engagement (ROE), National Training Center, 10 Aug 90

PERIODICALS, BOOKS, AND MISCELLANEOUS

EW in Wargamming, Journal of Electronic Defense, Nov 92

Turning Lessons Learned into Policy, Journal of Electronic Defense, Oct 93

Space and Electronic Warfare - A Navy Policy Paper on a New Warfare Area, Jun 92

Battlefield Sensors, May 94

DEFINITIONS

MODEL. A representation of a system.

SIMULATION. The operation or exercise of the model(s) of the system (or situation).

- **Constructive.** Relies heavily on algorithmic and mathematical methods. Typically not dependent on manned intervention to drive the simulation.

- **Virtual.** Manned simulators interacting within a synthetic environment.

- **Live.** Soldiers and equipment operating together against an actual force possibly on instrumented ranges.

ELECTRONIC WARFARE (EW). Any military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum (EMS) or to attack the enemy.

- **Electronic Attack (EA).** Involves the use of electromagnetic or directed energy to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability. Includes actions taken to prevent or reduce an enemy's effective use of the EMS, such as jamming and electromagnetic deception and employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, radio frequency weapons, particle beams).

- **Electronic Protection (EP).** Involves actions taken to protect personnel, facilities, and equipment from any effects of friendly or enemy employment of EW that degrade, neutralize, or destroy friendly combat capability.

- **Electronic Warfare Support (ES).** Involves actions tasked by, or under direct control of, an operational commander to search for, intercept, identify, and locate sources of intentional and unintentional radiated electromagnetic energy for the purpose of immediate threat recognition. Thus, ES provides information required for immediate decisions involving EW operations and other tactical actions such as threat avoidance, targeting, and homing.

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE:

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: _____

3. CATEGORY CODES:

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

- A. Model/Simulator Type:
 - (1) Analysis:
 - (2) Training and Education:
- B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution:
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven):
 - (4) Test Support:
- C. Simulation Compatibility:
 - (1) Constructive:
 - (2) Virtual:
 - (3) Live:
- D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons:
 - (2) Jamming:
 - (3) Electromagnetic Deception:
- E. Levels of Command:
 - (1) Highest Level Which Can Be Played:
 - (2) Lowest Level Which Can Be Played:
- F. Degree of Automation:
 - (1) Fully Automated:
 - (2) Man-in-the-Loop:
- G. Other:

PUBLICATION SUMMARY

ELECTRONIC ATTACK MODELLING AND SIMULATION

OSD and Joint Staff	Tab 1
US Army	Tab 2
Periodicals, Books, and Miscellaneous	Tab 3

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Modelling Handbook, Joint Electronic Warfare Center, Jun 89

PUB is: Current Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: This modelling handbook is designed to provide an overview of the Joint Electronic Warfare Center (JEWEC) Automatic Data processing System. It provides a comprehensive overview of the capabilities, limitations, and operational use of JEWEC hardware and software. It is a compendium of JEWEC models.

3. CATEGORY CODES: C1, D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education:

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive: p 2-51
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming: p 2-55
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Joint Electronic Combat Electronic Warfare Simulation (JECEWSI), Joint Electronic Warfare Center, Undated

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: The paper describes JECEWSI as a training exercise for command post exercises designated to focus on the electronic combat environment in support of tactical air and air defense operations. A functional description is provided along with information on the level of detail of processes and entities.

3. CATEGORY CODES: A2, B2, C1, D2, E1, E2, F1

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education: p 1

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type: p 1
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive: p 1
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming: p 1*
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played: p 1
- (2) Lowest Level Which Can Be Played: p 1

F. Degree of Automation:

- (1) Fully Automated: p 2
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Models and Simulations: Army Integrated Catalog (MOSIAC)

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: MOSIAC is a department of the Army Initiative to provide and maintain a central repository of information about all Army models and simulations. The MOSIAC can be obtained through the US Army Model and Simulation Management Office's (AMSMO) Bulletin Board System. To be a valid model or simulation entry in MOSIAC, a model or simulation must be computerized; represent entities or processes of interest to the Army; have an Army sponsor or an Army proponent; and be currently in use or in active development.

3. CATEGORY CODES: All categories apply for each iteration of models/simulations listed in the database. Database is a must read.

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education:

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive:
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

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- (2) Jamming:
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Army Model and Simulation Master Plan, USDA, May 94

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: This plan provides guidance for the development and adoption of standards for use in Army models and simulations. It represents corporate Army strategy for achieving a modelling and simulation environment without providing direct programming instruction.

3. CATEGORY CODES: G

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education:

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

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- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

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- (2) Jamming:
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other: Roles and missions of Army modelers and users:

p C-1

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Memo, Electronic Warfare (EW) Force Level Models, 1 Aug 94

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Memo addresses concerns by the Deputy Director, Electronic Warfare, OSD about the lack of modelling EW affects in force level modelling. Generic examples are provided on the low rate of EW modelling. The memo concludes by indicating guidance to SLAD, AMSAA and TRAC to improve the process of inserting system level effects into force level models is forthcoming.

3. CATEGORY CODES: A1, D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis: p 1
- (2) Training and Education:

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

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- (1) Constructive:
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- (3) Live:

D. Electronic Attack Levels of Warfare:

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- (2) Jamming: p 1
- (3) Electromagnetic Deception:

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F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Battle Lab Campaign Plan Primer 1994

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Primer is a two-part document summarizing the key advanced warfighting experiments planned for the period Apr 94 to Sep 95. Primer provides a listing of each experiment with a brief description of the event and the battle labs or other agencies involved in the event.

3. CATEGORY CODES: D1, D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education:

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive:
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons: p 5
- (2) Jamming: p 5
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Operational Requirements Document (ORD) for Warfighters' Simulation 2000 (WARSIM 2000), 24 Jul 93

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: The WARSIM 2000 ORD describes the functional requirements for a future simulation to support commander and battle staff training in a joint and operational environment.
3. CATEGORY CODES: A2, B1, B3, C1, D1, D2*, E1, E2, F1, F2
4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

- A. Model/Simulator Type:
 - (1) Analysis:
 - (2) Training and Education: p 1
- B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution: pg 4, 5
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven): p 1
 - (4) Test Support:
- C. Simulation Compatibility:
 - (1) Constructive: p 4-7
 - (2) Virtual:
 - (3) Live:
- D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons: p 5
 - (2) Jamming: p 5*
 - (3) Electromagnetic Deception:
- E. Levels of Command:
 - (1) Highest Level Which Can Be Played: p 1
 - (2) Lowest Level Which Can Be Played: p 1
- F. Degree of Automation:
 - (1) Fully Automated: pg 18, 19
 - (2) Man-in-the-Loop: pg 18, 19
- G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Draft Military Operations Operational Concept for Electronic Warfare, HQ TRADOC

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Draft publication is the TRADOC Operational Concept for Electronic Warfare. Draft concept outlines future Army EW operations employing Electronic Attack (EA), Electronic Protection (EP), and Electronic Support (ES) as an integral part of joint and/or combined operations. It identifies EW required capabilities in support of the full range of military operations using battle dynamics as a framework.

3. CATEGORY CODES: A2, D1*, D2*

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education: pg 28

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive:
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons: pp 6, 21*
- (2) Jamming: p 7*
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Combat Training Centers (CTCs) Bulletin Number 94-1, Mar 94

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: An article submitted by the battle command training program (BCTP) titled, "Deep Operations: A Look from BCTP at the Process" provides insights on doctrinal implications on how to fight the deep battle and the role electronic warfare plays in the decide-detect-track-deliver-assess methodology.
3. CATEGORY CODES: D2
4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

- A. Model/Simulator Type:
 - (1) Analysis:
 - (2) Training and Education:
- B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution:
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven):
 - (4) Test Support:
- C. Simulation Compatibility:
 - (1) Constructive:
 - (2) Virtual:
 - (3) Live:
- D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons:
 - (2) Jamming: pg 24-25
 - (3) Electromagnetic Deception:
- E. Levels of Command:
 - (1) Highest Level Which Can Be Played:
 - (2) Lowest Level Which Can Be Played:
- F. Degree of Automation:
 - (1) Fully Automated:
 - (2) Man-in-the-Loop:
- G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Inventory of TRADOC Models and Simulations, Feb 91

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: This is a catalogue of the primary models, war games, training simulations, and combat simulations used by TRADOC to support studies and analysis, operational test, drive command post exercises, or support training seminars. The information contained in this inventory describes key features, capabilities, and operating characteristics of current TRADOC models and simulations.

3. CATEGORY CODES: All categories apply for each iteration of models/simulations listed in the database. Database is a must read.

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

- A. Model/Simulator Type:
 - (1) Analysis:
 - (2) Training and Education:
- B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution:
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven):
 - (4) Test Support:
- C. Simulation Compatibility:
 - (1) Constructive:
 - (2) Virtual:
 - (3) Live:
- D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons:
 - (2) Jamming:
 - (3) Electromagnetic Deception:
- E. Levels of Command:
 - (1) Highest Level Which Can Be Played:
 - (2) Lowest Level Which Can Be Played:
- F. Degree of Automation:
 - (1) Fully Automated:
 - (2) Man-in-the-Loop:
- G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Information Papers, National Simulation Center, Oct 93

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Publication is a series of information papers prepared on individual Army training models and simulations. Models and simulations included are: Corps Battle Simulation, Simulator Networking-Training, Janus, Brigade/Battalion Battle Simulation, Army Training Battle Simulation System, Variable Intensity Computerized Training System, Warfighters' Simulation-2000, and Distributed Interactive Simulation.

3. CATEGORY CODES: ** Each Information Paper individually addresses unique aspects of training and education.

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

- A. Model/Simulator Type:
 - (1) Analysis:
 - (2) Training and Education: **
- B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution:
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven):
 - (4) Test Support:
- C. Simulation Compatibility:
 - (1) Constructive:
 - (2) Virtual:
 - (3) Live:
- D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons:
 - (2) Jamming:
 - (3) Electromagnetic Deception:
- E. Levels of Command:
 - (1) Highest Level Which Can Be Played:
 - (2) Lowest Level Which Can Be Played:
- F. Degree of Automation:
 - (1) Fully Automated:
 - (2) Man-in-the-Loop:
- G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Briefing, Intelligence and Electronic Warfare Functional Area Model (IEWFAM), USAICS, Undated

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Briefing papers provide an overview of the combat, collection management, sensor, processing and analysis, electronic countermeasures, and the command, control and communications functions contained in the IEWFAM. Also discussed in relationship to each function is associated variables, IEW impacts, and value added impacts.

3. CATEGORY CODES: A1, B4, C1, D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

- A. Model/Simulator Type:
 - (1) Analysis: pp 1, 2
 - (2) Training and Education:
- B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution:
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven):
 - (4) Test Support: p 1
- C. Simulation Compatibility:
 - (1) Constructive: p 1-3
 - (2) Virtual:
 - (3) Live:
- D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons:
 - (2) Jamming: pp 2 to 4
 - (3) Electromagnetic Deception:
- E. Levels of Command:
 - (1) Highest Level Which Can Be Played:
 - (2) Lowest Level Which Can Be Played:
- F. Degree of Automation:
 - (1) Fully Automated:
 - (2) Man-in-the-Loop:
- G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: TRADOC Pamphlet 525-5, Force XXI Operations, Aug 94

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: This pamphlet describes the conceptual foundations for the conduct of future operations in war, and operations other than war involving Force XXI--The US Army of the early twenty-first century. This pamphlet provides a vision of future conflict for the development of supporting concepts, programs, experiments, and initiatives.

3. CATEGORY CODES: D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education:

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive:
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming: p 3-11
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Corps Battle Simulation, Jet Propulsion Laboratory, Mar 92

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Information paper provides a generic tutorial on the operations of the Corps Battle Simulation (CBS). Tutorial covers the battle echelons and staff levels intended to use CBS as a training tool. It also details the areas of operations played in CBS to include military actions simulated by CBS.

3. CATEGORY CODES: B1, C1, E1, E2, F1, F2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

- A. Model/Simulator Type:
 - (1) Analysis:
 - (2) Training and Education:
- B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution: p 1
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven):
 - (4) Test Support:
- C. Simulation Compatibility:
 - (1) Constructive: p 1
 - (2) Virtual:
 - (3) Live:
- D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons:
 - (2) Jamming:
 - (3) Electromagnetic Deception:
- E. Levels of Command:
 - (1) Highest Level Which Can Be Played: p 1
 - (2) Lowest Level Which Can Be Played: p 1
- F. Degree of Automation:
 - (1) Fully Automated: p 1
 - (2) Man-in-the-Loop: p 1
- G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: The Janus 3.X/UNIX Model User's Manual, Titan, Inc., 30 Nov 93

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: This user's manual explains how to use an interactive wargaming simulation. It is used as an analysis tool to support COEAs, analysis of tactics and doctrine and other Army studies. It is also being used as a seminar and classroom educational tool for company, battalion, and brigade commands and staffs.

3. CATEGORY CODES: A1, A2, B3, C1, E1, E2, F1, F2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis: p 1
- (2) Training and Education: p 1

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven): p 1
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive: p 1
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming:
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played: p 1
- (2) Lowest Level Which Can Be Played: p 1

F. Degree of Automation:

- (1) Fully Automated: p 1
- (2) Man-in-the-Loop: p 1

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Brigade/Battalion Battle Simulation System Overview, National Simulation Center, 23 May 94

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: It is a system overview of a simulation CPX driver for brigade and battalion commanders to train their battle staffs in combat and battlefield operations procedures. The "BBS Overview" introduces BBS and gives a brief description of requirements and documentation.
3. CATEGORY CODES: A2, C1, E1, E2
4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education: p 1

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive: p 5
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming:
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played: p 5
- (2) Lowest Level Which Can Be Played: p 5

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: VICTORS Commander Planning Guide, National Simulation Center, 11 Aug 93

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: The VICTORS (Variable Intensity Computerized Training System) planning guide is an introduction to the use of a battle simulation exercises driver. VICTORS combines manual battle board execution with computer assisted modelling to replicate operations short of war and low through high intensity conflict. This simulated environment provides the battle staff the opportunity to refine warfighting skills and obtain practical experience.

3. CATEGORY CODES: A2, B3, D2, E1, E2, F2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education: p 3

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven): p 3
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive:
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming: pp 57, 60 to 63
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played: p 5
- (2) Lowest Level Which Can Be Played: p 5

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop: p 3

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: How to Train with ARTBASS, CATA, Jul 93

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: The Army Training Battle Simulation System (ARTBASS) provides a means for maneuver battalion commanders to train their command groups and staffs on the conduct of battlefield operations IAW current doctrine. This publication is designed to assist ARTBASS commands and units in conducting simulated tactical exercise. NOTE: Currently ARTBASS is being fielded only to reserve units. Active duty units are receiving BBS in lieu of ARTBASS.

3. CATEGORY CODES: A2, B3, C1, E1, E2, F1, F2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education: p 1-1

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven): p 1-2
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive: p 1-2
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming:
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played: p 1-1
- (2) Lowest Level Which Can Be Played: p 1-1

F. Degree of Automation:

- (1) Fully Automated: p 1-1
- (2) Man-in-the-Loop: p 1-1

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Exercise Rules of Engagement (EXROE), JRTC, FY92

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: EXROE provides the framework for the conduct of force-on-force training at the JRTC.

3. CATEGORY CODES: A2, B1, C3, D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education: p 1-1

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution: p 1-3
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive:
- (2) Virtual:
- (3) Live: p 1-3

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming: p 3-5
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Rules of Engagement (ROE), NTC, 10 Aug 90

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: ROE provides the framework for the conduct of force-on-force training at the NTC.

3. CATEGORY CODES: A2, B1, C3, D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

(1) Analysis:

(2) Training and Education: p 3

B. Model/Simulator Category:

(1) Force on Force, High/Low Resolution: p 4

(2) Functional Type:

(3) Training (Manual/Computer Assisted/Computer Driven):

(4) Test Support:

C. Simulation Compatibility:

(1) Constructive:

(2) Virtual:

(3) Live: p 3

D. Electronic Attack Levels of Warfare:

(1) Directed Energy Weapons:

(2) Jamming: p 24

(3) Electromagnetic Deception:

E. Levels of Command:

(1) Highest Level Which Can Be Played:

(2) Lowest Level Which Can Be Played:

F. Degree of Automation:

(1) Fully Automated:

(2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: EW in Wargamming, Journal of Electronic Defense, Nov 92

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Article discusses the role of the Joint Electronic Combat Electronic Warfare Simulation (JECEWSI) in the training of commanders and staffs on the use of EW as a force multiplier. Background on the origin of JECEWSI and how the model operates is provided.
3. CATEGORY CODES: A2, B3, C1, D2, F1
4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):
 - A. Model/Simulator Type:
 - (1) Analysis:
 - (2) Training and Education: p 61
 - B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution:
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven): p 61
 - (4) Test Support:
 - C. Simulation Compatibility:
 - (1) Constructive: p 62
 - (2) Virtual:
 - (3) Live:
 - D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons:
 - (2) Jamming: p 62
 - (3) Electromagnetic Deception:
 - E. Levels of Command:
 - (1) Highest Level Which Can Be Played:
 - (2) Lowest Level Which Can Be Played:
 - F. Degree of Automation:
 - (1) Fully Automated: p 63
 - (2) Man-in-the-Loop:
 - G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Turning Lessons Learned into Policy, Journal of Electronic Defense, Oct 93

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Article discusses the recent policy changes in electronic warfare and uses lessons learned from Desert Shield/Dessert Storm to illustrate the changes. The author discussed EW in context to its new role in command and control warfare and the need to make EW more relevant to the warfighting CINC as a need to move fully integrate offensive EW into warfighting.

3. CATEGORY CODES: D1, D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

- A. Model/Simulator Type:
 - (1) Analysis:
 - (2) Training and Education:
- B. Model/Simulator Category:
 - (1) Force on Force, High/Low Resolution:
 - (2) Functional Type:
 - (3) Training (Manual/Computer Assisted/Computer Driven):
 - (4) Test Support:
- C. Simulation Compatibility:
 - (1) Constructive:
 - (2) Virtual:
 - (3) Live:
- D. Electronic Attack Levels of Warfare:
 - (1) Directed Energy Weapons: p 87
 - (2) Jamming: pp 87 to 92
 - (3) Electromagnetic Deception:
- E. Levels of Command:
 - (1) Highest Level Which Can Be Played:
 - (2) Lowest Level Which Can Be Played:
- F. Degree of Automation:
 - (1) Fully Automated:
 - (2) Man-in-the-Loop:
- G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Space and Electronic Warfare - A Navy Policy Paper on a New Warfare Area, Jun 92

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: Publication provides a layout of the Navy's vision and policy for Space and Electronic Warfare (SEW). Discusses the three general types of technology required to conduct SEW. Publication identifies three major technological subsystems and the requirements associated with each subsystem.

3. CATEGORY CODES:

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education:

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive:
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming:
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

LITERATURE SEARCH

ELECTRONIC ATTACK MODELLING AND SIMULATION

1. PUBLICATION/SOURCE: Battlefield Sensors, May 94

PUB is: Current/Outdated -- Essential/Helpful/Not Relevant

2. SYNOPSIS: This report was prepared by the Computer Sciences Corporation for the Dismounted Battle Space Battle Lab. Report provides a listing of battlefield sensor systems and sensor processors, regardless of how, or at what level they were employed. Report also provides basic findings and recommendations. Results of the report will be used as a basis for determining if additional sensors and sensor platforms are needed to provide the decisionmaking battle space information required by brigade and battalion commanders.

3. CATEGORY CODES: D2

4. CONTENT HIGHLIGHTS (BY CATEGORY CODES, * Must Read):

A. Model/Simulator Type:

- (1) Analysis:
- (2) Training and Education:

B. Model/Simulator Category:

- (1) Force on Force, High/Low Resolution:
- (2) Functional Type:
- (3) Training (Manual/Computer Assisted/Computer Driven):
- (4) Test Support:

C. Simulation Compatibility:

- (1) Constructive:
- (2) Virtual:
- (3) Live:

D. Electronic Attack Levels of Warfare:

- (1) Directed Energy Weapons:
- (2) Jamming: pp B-30 to B-33
- (3) Electromagnetic Deception:

E. Levels of Command:

- (1) Highest Level Which Can Be Played:
- (2) Lowest Level Which Can Be Played:

F. Degree of Automation:

- (1) Fully Automated:
- (2) Man-in-the-Loop:

G. Other:

ELECTRONIC ATTACK MODELLING AND SIMULATION
LITERATURE SEARCH

FUNCTIONAL AREA		Model/Simulator Type	Analysis	Training and Education	Model/Simulator Category	Force on Force	Functional Type	Training	Test Support	Simulation Compatibility	Constructive	Virtual	Live	Electronic Attack Levels	Directed Energy Weapons	Jamming	Electromagnetic	Levels of Command	Highest Level Played	Lowest Level Played	Degree of Automation	Fully Automated	Man-in-the-Loop	Other
H	D-1-1										X					X								
E	D-1-2			X			X				X					X			X	X		X		
E	D-2-1																							
H	D-2-2																							X
H	D-2-3		X													X								
H	D-2-4														X	X								
E	D-2-5			X		X	X				X				X	X			X	X		X	X	
E	D-2-6			X											X	X								
H	D-2-7															X								
E	D-2-8																							
H	D-2-9			X																				
H	D-2-10		X						X		X					X								
H	D-2-11															X								
H	D-2-12					X					X								X	X		X	X	
H	D-2-13		X	X				X			X								X	X		X	X	
H	D-2-14			X							X								X	X				
H	D-2-15			X			X								X				X	X			X	
H	D-2-16			X			X				X								X	X		X	X	
H	D-2-17			X		X						X			X									

<u>FUNCTIONAL AREA</u>																	
<u>Model/Simulator Type</u>																	
<u>Analysis</u>																	
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<u>Highest Level Played</u>																	
<u>Lowest Level Played</u>																	
<u>Degree of Automation</u>																	
<u>Fully Automated</u>																	
<u>Man-in-the-Loop</u>																	
<u>Other</u>																	
H	D-2-18			X		X											
H	D-3-1			X			X		X				X			X	
H	D-3-2											X	X				
NR	D-3-3																
H	D-3-4												X				

E - ESSENTIAL
 H - HELPFUL
 NR - NOT RELEVANT

MODEL/SIMULATION DATA

High Energy Laser Weapon System (HELAWS)	G-2
Low Energy Laser Weapons Simulation (LELAWS)	G-3
Army Laser Weapons Simulation (ALWSIM)	G-4
Combat Arms Task Force Engagement Model (CASTFOREM)	G-5
VECTOR in Command (VIC)	G-6
Eagle	G-7
Computer-Assisted Map Exercise (CAMEX)	G-8
Janus	G-9
Brigade/Battalion Battle Simulation (BBS)	G-10
Variable Intensity Computerized Training System (VICTORS) .	G-11
Corps Battle Simulation (CBS)	G-12
Warfighters' Simulation 2000 (WARSIM 2000) - Future Development	G-13
Joint Electronic Warfare Electronic Combat Simulation (JEWECSEI)	G-14

MODEL/SIMULATION DATA SHEET

1. TITLE: High Energy Laser Weapon System (HELAWS)
2. TYPE: Engineering, Item Level
3. PROPONENT: US Army Materiel Systems Analysis Activity
4. POINT OF CONTACT: Mr. Michael Vincent
5. PURPOSE: To evaluate the item level effectiveness of high energy lasers in the anti-sensor role.
6. DESCRIPTION: HELAWS is used as a system analysis model. It is a rather detailed engineering model which accounts for most of the physics of laser beam propagation and its interaction with a target. The model characterizes the laser weapon output, propagation through the atmosphere, and the vulnerability of the optical or electro-optical target sensor.
7. CONSTRUCTION CHARACTERISTICS: The model is written in FORTRAN. There is no human participation and the model is one sided. Its treatment of randomness is stochastic and Monte Carlo.
8. SUBJECTIVE ASSESSMENT: None

MODEL/SIMULATION DATA SHEET

1. TITLE: Low Energy Laser Weapons Simulation (LELAWS)
2. TYPE: Engineering, Item Level
3. PROPONENT: US Army Materiel System Analysis Activity
4. POINT OF CONTACT: Mr. Michael Vincent
5. PURPOSE: Is to calculate the probability of laser energy exceeding a given threshold at a target.
6. DESCRIPTION: LELAWS simulates the propagation and modification of a low energy laser pulse traveling through the atmosphere and striking a target sensor aperture. LELAWS models effects on pulse propagation which includes energy attenuation, beamsread and beamwander, pointing jitter, initial wavefront distortion, scintillation, diffraction effects and target aperture averaging.
7. CONSTRUCTION CHARACTERISTICS: The model is written in FORTRAN. There is no human participation and the model is one sided. Its treatment of randomness is stochastic and Monte Carlo.
8. SUBJECTIVE ASSESSMENT: None

MODEL/SIMULATION DATA SHEET

1. TITLE: Army Laser Weapons Simulation (ALWSIM)
2. TYPE: System Analysis - Force on Force
3. Proponent: US Army Materiel Systems Analysis Activity
4. POINT OF CONTACT: Mr. Arthur Gordon
5. PURPOSE: Is to provide estimates of the contributions of developmental or conceptual weapon systems to military force effectiveness. Also useful for examining alternative weapon deployment tactics and operational doctrine.
6. DESCRIPTION: Simulates a brief intense close combat between battalion or company size forces. Design allows for the play of vignettes evolving from standardized scenarios. Models of weapon systems are functional rather than detailed engineering models since the primary purpose is system effectiveness evaluation.
7. CONSTRUCTION CHARACTERISTICS: The program is written in FORTRAN 77. There is no human participation. It is two sided and the treatment of randomness is stochastic and Monte Carlo. The model's time processing is dynamic, mainly event-step, but some time-step.
8. SUBJECTIVE ASSESSMENT: None

MODEL/SIMULATION DATA SHEET

1. TITLE: Combat Arms Task Force Engagement Model (CASTFOREM)
2. TYPE: Analysis
3. PROPONENT: US Army TRADOC Analysis Center-White Sands Missile Range
4. POINT OF CONTACT: Mr. Carrol Denney
5. PURPOSE: CASTFOREM is used for weapon systems and tactics evaluation for brigade and below combined arms conflicts. It provides a capability for weapon system tradeoff analysis, parametric analysis of a specific weapon system or performance parameters, development of operational and organizational concepts, and a model test environment.
6. DESCRIPTION: CASTFOREM is the Army's highest resolution, lowest echelon, systemic, combined arms, combat simulation model. Opposing forces simulation of ground combat involving up to an attacking brigade force and against a defending reinforced regiment. This is considered maximum force size due to practicality of computer run time and complexity of analysis. Battle run times are typically constrained to 90 minutes or less.
7. CONSTRUCTION: Human intervention is not required. The programming language is SImscript II.5 and FORTRAN. The model is event sequenced and time-step events are possible. The treatment of randomness is stochastic and it is two-sided symmetric.
8. SUBJECTIVE ASSESSMENT: At a minimum, the basic EA functional system models for low and high energy lasers and electronic jamming are already included in this model. The data required to execute the electronic jamming models needs to be developed. This is the primary high intensity analytical model used in combat developments and is also used in various Army Warfighting Experiments. Better utilization of the CASTFOREM EA models should provide greater statistical credibility to any efforts to determine a relative effectiveness of EA as a component of command and control warfare.

MODELS/SIMULATIONS DATA SHEETS

1. TITLE: Vector in Command (VIC)
2. TYPE: Analysis
3. PROPONENT: US Army TRADOC Analysis Center, Operations Analysis Center
4. POINT OF CONTACT: Mr. Dick Calkins
5. PURPOSE: VIC is an analytical, mid-to-high intensity model used to examine light and heavy force tactics and concepts, force design and structure tradeoff analysis, major organization/system comparison and to evaluate alternative operational concepts.
6. DESCRIPTION: VIC is a simulation of integrated land and air combat. It is a force-on-force model with an aggregation level typically at the maneuver battalion or its equivalent. Employment of forces is up to the level of a US corps facing a threat determined by scenario and theater. The highest level of command played is corps/front and the lowest level platoon/company. Four echelons per wargaming can be played. Resolution if appropriate can be at the item level.
7. CONSTRUCTION: VIC requires no human participation once the simulation commences. However, the model can be interrupted if desired by the user. It is two sided with a dynamic time- and event-step processing capability. The treatment of randomness is deterministic. The software programming language is SIMSCRIPT AND FORTRAN.
8. SUBJECTIVE ASSESSMENT: The IEW functional area model which contains an EA capability is integrated into VIC as the IEW component. However, the EA function is currently not being used due to the lack of data/decision tables required for the EA capability to be exercised as an integral component of the simulation. Consequently, the ability to make military assessments of the EA utility/effectiveness to command and control warfare is probably marginal at best.

MODEL/SIMULATION DATA SHEET

1. TITLE: Eagle
2. TYPE: Analysis, Education, and Training
3. PROPONENT: US Army TRADOC Analysis Center, Operations Analysis Center
4. POINT OF CONTACT: Mr. H. Kent Pickett
5. PURPOSE: Eagle is a corps/division-level combat model that simulates the operational level of war and includes joint and combined operations. It is intended to demonstrate the feasibility of vertical linkage through its linkage to SIMNET and DIS that includes semi-automated forces and simulators.
6. DESCRIPTION: Eagle is a simulation of integrated land and air combat. It is a low resolution force-on-force model with an aggregation level typically at the maneuver battalion or company level. Employment of forces is generally corps to battalion or division to company. The highest level of command played is corps and the lowest level is battalion/company. There is no limit to the number of echelons per game that can be played. Resolution, if appropriate, can be at the item level.
7. CONSTRUCTION: Simulation is designed for human intervention if desired. It uses time-stepped events, except for air-to-air defense interactions that are event based. The treatment of randomness is deterministic and it is multi-sided.
8. SUBJECTIVE ASSESSMENT: Its multi-functional use for analysis, training, and education warrants the need to play the three functional components of EW. Air and ground EW sensors are played explicitly and the emphasis in the model is on sensor management. Future model enhancements should include planning for and use of EA assets as a viable response to threat targets.

MODEL/SIMULATION DATA SHEET

1. TITLE: Computer-Assisted Map Exercise (CAMEX)
2. TYPE: Analysis, Education, and Training
3. PROPONENT: US Army TRADOC Analysis Center, Operations Analysis Center
4. POINT OF CONTACT: Mr. Terry Gach
5. PURPOSE: CAMEX is a computer-assisted simulation that explicitly represents battlefield units conducting doctrinal operations. It provides a front-end analysis of courses of action and other analysis such as force structuring, parametric ranging, and tactics and concepts.
6. DESCRIPTION: CAMEX is a land and air combat model that simulates corps and division-level operations. It is an independent VIC-based model designed to allow human intervention.
7. CONSTRUCTION: Simulation is designed for maximum human involvement. It is two sided and allows for open or closed wargaming. Time processing is deterministic and a treatment of randomness does not apply. The software programming language is SIMSCRIPT II.5.
8. SUBJECTIVE ASSESSMENT: The EW sensors and sensor management function is played with extensive human involvement during the conduct of the simulation. The EA function is not modeled and would be a logical wargaming enhancement to provide an integrated command and control capability, especially in light of the simulations used in Prairie Warrior exercises and general officer workshops.

MODEL/SIMULATION DATA SHEET

1. TITLE: Janus
2. TYPE: Analysis, Research and Development, Test and Evaluation, Education and Training
3. PROPONENT: US Army TRADOC Analysis Center-White Sands Missile Range
4. POINT OF CONTACT: Analysis - Dr. R. M. Parish
Training - MAJ Jordan (NSC)
5. PURPOSE: Janus is multi-purpose, high-resolution war game. It is used to explore the relationships of combat and tactical processes. Players make doctrinal and tactical decisions, deploy forces, develop scenarios, and make and execute plans.
6. DESCRIPTION: Janus has an interactive, precise color graphics force-on-force, digitized terrain simulation capability designed for conventional and low-intensity conflicts. The highest command level is brigade and the lowest is system with resolution typically at item level.
7. CONSTRUCTION: Janus requires human participation to make a number of wargaming decisions. The time processing is dynamic, event-sequenced and the treatment of randomness is stochastic. It is two sided, asymmetric with both sides reactive.
8. SUBJECTIVE ASSESSMENT: Janus is a key high resolution analysis and training tool. The model's immediate significance for the EA function of EW is the capability it provides to simulate the operational use of unit level directed energy (laser) weapons (current and future).

MODEL/SIMULATION DATA SHEET

1. TITLE: Brigade/Battalion Battle Simulation (BBS)
2. TYPE: Training and Education
3. PROPONENT: National Simulation Center
4. POINT OF CONTACT: MAJ Johnson
5. PURPOSE: BBS provides brigade and battalion commanders a CPX driver to train their battle staffs in combat and battlefield operations in a realistically simulated, multi-threat, time-stressed combat environment.
6. DESCRIPTION: BBS is designed to support real-time, interactive processes and is architecturally configured as a distributive data processing system featuring high-speed graphics and data communications networking. It is a system of usually 10 or up to 23 netted microcomputer-based workstations. Stations communicate across a high-speed network that allows the sharing of information and the updating of simulation model-driven data between all workstations at 15 second intervals.
7. CONSTRUCTION: Interactive distributive processing among multiple workstations. The simulation is real-time, man-in-the-loop play. Interface to the model is through controllers which play subordinate units, therefore making the simulation transparent to the training audience. The software programming language is MODULA-2.
8. SUBJECTIVE ASSESSMENT: This simulation is an excellent candidate to model EA assets, particularly directed energy weapons (lasers) as developed and placed in unit inventory.

MODEL/SIMULATION DATA SHEET

1. TITLE: Variable Intensity Computerized Training System (VICTORS)
2. TYPE: Training and Education
3. PROPONENT: National Simulation Center
4. POINT OF CONTACT: Mr. Dennis Chrisman
5. PURPOSE: VICTORS is a CPX driver that exercises a battle staff at battalion through division level using a manual battleboard with computer assisted combat modelling.
6. DESCRIPTION: VICTORS replicates operations short of war and low through high intensity conflict. Controllers act as forces above and adjacent to the battle staff and ensure realism in simulating battlefield activity. VICTORS produces only the stimulus to exercise the battle staff. An EA level of effectiveness is played manually through the controller once a target is identified, an EA (jamming) request initiated, and player briefs the controller on the intended jamming operation.
7. CONSTRUCTION: VICTORS is stochastic model providing for two sided freeplay or one sided scripted play which is driven by a Master Event and Incident List. Easily adaptable to any geographical area of operation using any tactical scenario. The software programming language is Pascal. It is adaptable to most computer operating system.
8. SUBJECTIVE ASSESSMENT: VICTORS provides a adequate level of EA play considering the computer-assisted battleboard design and construction.

MODEL/SIMULATION DATA SHEET

1. TITLE: Corps Battle Simulation -(CBS)
2. TYPE: Training and Education War Game
3. Proponent: National Simulation Center
4. POINT OF CONTACT: MAJ Metivier
5. PURPOSE: CBS is a computerized battle simulation system designed to drive Joint Readiness Exercises, Army corps and division CPXs, and Battle Command Training Program (BCTP) Warfighter exercises and seminars. CBS also forms the core of the Aggregate Level Simulation Protocol Confederation used to support joint force training up to theater level.
6. DESCRIPTION: CBS runs on a network of DEC MicroVax minicomputers with the primary processor being a DEC mainframe computer. Each corps site has a mainframe and approximately 39 workstations. Friendly ground combat forces are generally modeled down to company level. OPFOR ground combat forces usually modeled as battalions. Controllers located in the computerized simulation center, interact with a battle staff training audience. The controllers provide a realistic interface between the CBS and training audience.
7. CONSTRUCTION: Human participation is required for decisions. However, simulation will run without decisions. Time processing in dynamic, time-step. Treatment of randomness is stochastic and Monte Carlo. It is two sided, asymmetric with both sides being reactive.
8. SUBJECTIVE ASSESSMENT: CBS terrain play (3km hex grids) currently restricts line of sight modelling of EA assets. This tends to limit the training audience (battle staffs) need to adequately plan for the operational use of EA assets as a critical combat multiplier component of command and control warfare. This line of sight limitation takes on greater importance at the higher command levels such as corps and theater.

MODEL/SIMULATION DATA SHEETS

1. **TITLE:** Warfighters' Simulation 2000 (WARSIM 2000) - Future Development
2. **Training and Education War Game**
3. **PROPONENT:** National Simulation Center
4. **POINT OF CONTACT:** Mr. Westmoreland
5. **PURPOSE:** WARSIM 2000 purpose is to provide a realistic simulation environment to train commanders, battle staffs from brigade through theater. Theater and joint task force training will be conducted in conjunction with other service models through a distributive interactive simulation (DIS) network.
6. **DESCRIPTION:** WARSIM 2000 is the replacement for CBS and will be designed to meet the future standards for "openness" and interoperability. The system will be capable of supporting a large exercise or several small exercises and will use digitized terrain data. There is an approved Operational Requirements Document that requires a level of detail that captures the effects of individual entities on the battle. Individual, low density, entities such as jammers that operate in a geographically dispersed mode must be portrayed as they are employed.
7. **SUBJECTIVE ASSESSMENT:** WARSIM 2000 operational requirements meet the training simulation needed to ensure EA assets are modeled at the entity level and thus drive the need for battle staff to plan for and operationally use EA as a viable component of command and control warfare.

MODEL/SIMULATION DATA SHEET

1. TITLE: Joint Electronic Warfare Electronic Combat Simulation (JEWEC SI)
2. TYPE: A functional EW training exercise driver.
3. PROPONENT: Joint Electronic Warfare Center
4. POINT OF CONTACT: Mr. William Boyers
5. PURPOSE: JEWEC SI is a training exercise driver for CPXs designed to focus on the electronic combat environment in support of tactical air and air defense operations. The model quantifies the effects of EW systems on the outcome of the training scenario. JEWEC SI has the following capabilities: standoff and self-protect jamming against radars and communications.
5. DESCRIPTION: Accommodates scales from individual up to theater depending on degree of complexity in database development. Uses smooth curved earth. Capability exists to add digitized terrain. Considers mix of forces from the system level to the combined force level. JEWEC SI has a direct interface with the Air Warfare Simulation System (AWSIMS) and plays the electronic environment in AWSIMS. JEWEC SI also has a one-way feed from CBS (location of friendly ground air defense radars passed to JEWEC SI) via ALSP.
6. CONSTRUCTION: JEWEC SI is fully automatic and human participation is not required. Resolution of EW is deterministic base on employment of radar and communication propagation equations. The simulation is two sided, asymmetric with both sides reactive.
7. SUBJECTIVE ASSESSMENT: JEWEC SI has the potential to provide the EA functional interface required to simulate EA activity for all Army combat echelons. In particular, it could interface with the Army's primary analysis and training simulations. The principle hurdle appears to be the need to model digitize terrain. Future development efforts could possibly allow JEWEC SI to play the EA (jamming) environment for CBS.